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भाग 2 माँड रहित तथा परिष्कृत कपड़े

Indian Standard

TEXTILES — FABRICS, WOVEN GLASS FIBRE, FOR ELECTRICAL INSULATION AND PLASTIC LAMINATE — SPECIFICATION

PART 2 DESIZED AND FINISHED FABRICS

UDC 677·52 : 621·315·614·1

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

August 1991 **Price Group 4**

Industrial/Engineered Fabrics Sectional Committee, TXD 24

FOREWORD

This Indian Standard (Part 2) was adopted by the Bureau of Indian Standards, after the draft finalized by the Industrial/Engineered Fabrics Sectional Committee had been approved by the Textile Division Council. This standard is being published in two parts :

Part 1 Loomstate fabrics
Part 2 Desized and finished fabrics

The fabrics covered in this specification are intended for use, after further treatment, for electrical insulation including those required in making laminates (clad or unclad) for printed circuit boards. In order to accommodate the need for fabrics of consumption not covered in this specification, procedure where by such fabrics shall be ordered subject to the requirements laid down in this specification has been included.

The woven glass fibre fabrics in finished state are suitable for impregnating with resin and subsequent use in electrical insulation including that required in making laminates (clad or unclad) for printed circuit boards. Two grades of finished woven glass fibre fabrics are covered in this standard, namely Grade 'S' for Silane finish and Grade 'C' for Chrome finish.

The glass fibre yarn is coated with size of lubricant to prevent abrasion during weaving. However, the presence of size/lubricants affects wetting of the fabric by resins and prevents effective bonding of glass and resin. The failure to remove the size subsequently results in laminates with high cover factor and high water absorption which are not desirable for electrical insulation purposes. Hence, the requirements of desized fabric have also been covered.

The requirements of loomstate fabric are covered in Part 1 of this standard. For information the most popular varieties are again given in Annex C for an easy reference. However, the details given in Part 1 of this standard shall be applicable for technical intrepretation.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

TEXTILES — FABRICS, WOVEN GLASS FIBRE. FOR ELECTRICAL INSULATION AND PLASTIC LAMINATE — SPECIFICATION

PART 2 DESIZED AND FINISHED FABRICS

1 SCOPE

This standard (Part 2) specifies the requirements for woven glass fabrics in desized and finished state. In case of finished fabrics, two grades of finishes, most commonly used, have been indicated below:

a) Grade 'S' — Silane finish (or finish of equivalent performance)

b) Grade 'C' — Chrome finish

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.1 For the purpose of this standard, the definition given below and those given in IS 13128 (Part 1) : 1991 shall apply (*see also* SP 45 : 1988).

3.2 Finish

A chemical treatment applied to a desized woven glass fibre fabric to enhance the mechanical properties and resistance to moisture of the combination of glass fabric and impregnating resin.

4 MANUFACTURE

4.1 Finish

The finish provides lubrication to the fabrics and improves the bond between the glass and the resin which is applied to the glass fibre fabric subsequently. The fabric shall be imparted with Silane or Chrome finish.

NOTES

1 The fabric may also be imparted with any other finish, as agreed to between the buyer and the seller.

2 No change shall be made in the type of finish without the concurrence of the buyer.

5 REQUIREMENTS OF DESIZED FABRICS

5.1 The fabric woven with sized yarn shall be desized by a suitable process either a two stage treatment involving aqueous wash followed by suitable heat treatment or a two step heat treatment alone. The desized fabric shall conform to the requirements specified in Part 1 (*see* Annex C) of this standard including the following.

5.1.1 *Residual Size Content*

The residual size content of the desized fabric shall be 0·1 percent, *Max*, when tested by the method given in **B-1**.

5.1.2 *Breaking Strength*

The breaking strength of the desized fabric shall not be less than 35 percent of the value specified for loomstate fabric as given in Part 1 (*see* Annex C) when determined by the method given in **B-2**.

5.1.3 *Colour*

The colour of the desized fabric shall be uniform.

6 REQUIREMENTS OF FINISHED FABRICS

6.1 The fabric shall conform to requirements specified in Part 1 (*see* Annex C) of the standard including the following.

6.1.1 *Electrical Conductivity*

The electrical conductivity of 5 percent aqueous extract of finished fabric shall be not more than 7·0 mS/m (70 micro mho/cm) determined as per IS 4420 : 1967.

6.1.2 *Breaking Strength*

The breaking strength of the fabric shall not be less than 40 percent of value specified for loomstate fabrics as given in Part 1 (*see* Annex C) when determined by the method given in **B-2**.

6.1.3 *Amount of Finish*

The amount of finish as determined by carbon/ LOI (Loss on Ignition) analysis shall range from 0·075 to 0·3 percent based on mass of fabric, when tested by the method given in **B-1**.

6.1.3.1 The quantitative detection of presence of Silane on finished glass fabric may be carried out by the method given in **B-3**.

6.1.3.2 The quantitative analysis of amino-silane content on finished glass fabric may be carried out by the method given in **B-4**; the quantitative analysis of chrome content may be carried out by the method given in **B-5**; and the quantitative analysis of silane (including amino) content of finished glass fabric may be carried out by method given in **B-6**.

7 INSPECTION AND WORKMANSHIP

7.1 The fragile nature of glass fibre fabric envisages careful handling during inspection. Thus physical damage or distortion of fabric shall be avoided. This is applicable especially to thin varieties (styles) with high thread density.

7.1.1 In order to have proper inspection of fabric, it is recommended traversing of the fabric over a flat viewing area at a speed of at least 1 linear metre by the full width of the fabric. A lighting source shall be mounted parallel to the viewing surface of the fabric so as to illuminate the surface with an overhead perpendicular light. The viewing and inspecting distance shall be approximately 1 m.

7.1.2 The fabric roll length shall be measured by a suitable device such that the movement of fabric through the machine will turn the wheels of the counting device by friction. Care shall be taken to cover the surface of the wheels with a suitable friction material in order to prevent slippage.

7.2 The fabric rolls shall be examined for the following defects:

a) Tight selvedges,
b) Loose selvedges,
c) Bagginess,
d) Continuous wrinkles/creases or ridgy cloth,
e) Uncleanliness or generally dirty,
f) Continuous excessively fuzzy or hairy surface as caused,
g) Lint (continuous appearance of loose tufts or fibres),
h) Colour (significant variation from normal colour of fibre glass greige fabrics), and
j) Visible cuts or tear on the body of the fabric.

7.2.1 A roll containing one or more of the above defects per 100 m length shall be considered as a defective roll.

7.3 Warp/Weft Defects

The rolls shall be examined for warp and weft defects as given below:

a) Cut or broken selvedges:
b) Bias or bowed weft (distorted from horizontal by more than 7·5 cm for every one metre width);
c) Broken picks;
d) Dirt spots (clearly visible grease, oil or dirt on fabrics);
e) Missing ends;
f) Floats (warp or weft yarns extending over 5 cm or more);
g) Coats (foreign matter, dirt or lint woven into fabric);
h) Knots (yarn tied together with overhanging tails);
j) Loops or kinks (double back yarn);
k) Loose picks (single weft yarn woven under insufficient tension);
m) Picks not properly interplaced;
n) Mixed yarn (yarn differing from those normally being used in the fabric);
p) Pull-ins (extra thread extending only a part of the way across fabrics);
q) Weft bars (weft band containing more or less than the normal number of picks);
r) Slubs (abruptly thickened placed in yarns);
s) Thin spots (open streak of variable length parallel to warp or weft); and
t) Printed markings (any marking except printed at the ends of the roll).

7.3.1 The roll shall be penalized for each defect as given below:

Defect Length (Warp, Weft or both)	*Penalty Points*
Up to 30 cm	1
Above 30 up to 45 cm	2
Above 45 up to 91 cm	3

NOTES

1 Any 1 metre of fabric shall not be penalized by more than 3 points.

2 The combination of both warp and weft defects occurring every 1 metre of fabric shall not be penalized by more than 3 points.

3 In case of holes, smashes or tight picks, 3 penalty points shall be given for each occurrence.

7.3.2 The penalty points for every 100 m length of roll shall not exceed 75. Any roll having more than 75 penalty points per 100 m length shall be considered as a defective roll.

7.3.3 The rolls in which any of the warp or weft defects listed in **7.3** occurrence repeatedly throughout the entire roll shall be considered a defective roll.

7.4 Splicing

In case the fabric is intended for continuous treatment application, there shall be maximum of 1 splice per 875 m and no segment shall be less than 350 m length. All splices shall be flagged and shall be compatible with solvents.

8 PACKING

The fabric shall be rolled evenly on tubes of sufficient length and strength to produce firm packages so as to prevent collapsing or telescoping during transit, storage or handling. Both ends of the roll shall be suitably protected to prevent damage to the edges of the fabric. Each roll shall be covered in black polyethylene film end individually packed in a moisture-proof container.

9 MARKING

9.1 Each roll of fabric shall be marked with the following:

a) Designation of the fabric (*see* **5.1** of Part 1) and/or Variety No. or Style No. (*see* Annex C),

b) The word 'Desized Fabric' or 'Finished Fabric' along with the type and name of finish,

c) Indication of the source of manufacture,

d) Length and width of roll,

e) Net mass, and

f) Date of manufacture of Batch No.

9.1.1 The rolls may also be marked with the Standard Mark.

10 SAMPLING AND CRITERIA FOR CONFORMITY

10.1 Lot

In any consignment all rolls/pieces of the same variety and type and delivered to a buyer against one despatch note shall constitute a lot.

10.1.1 The conformity of a lot to the requirements of this specification shall be determined on the basis of the tests carried out on the samples selected from the lot.

10.2 Unless otherwise agreed to between the buyer and the seller, the number of rolls/pieces to be selected at random from a lot for inspection shall be according to col 1 and 2 of Table 1. To ensure randomness of selection, procedure given in IS 4905 : 1968 shall be followed (*see also* IS 3919 : 1966 and IS 5463 : 1969).

Table 1 Sample Size and Permissible Number of Non-Conforming Rolls/Pieces

(*Clauses* 10.2 *and* 10.3)

Number of Rolls/ Pieces in the Lot	**Physical**		**Other Requirements**
	Number of Rolls/ Pieces to be Inspected	Permissible Number of Non-Conforming Rolls/ Pieces	Number of Rolls/ Pieces to be Tested
(1)	(2)	(3)	(4)
Up to 100	5	0	3
101 to 150	8	0	3
151 to 300	13	1	5
301 to 500	20	1	5
501 to 1 000	32	2	8
1 001 and above	50	3	13

10.3 The number of tests and criteria for conformity for various characteristics shall be as follows:

Characteristics	*Number of Tests*	*Criteria for Conformity*
a) *Physical*		
Visual inspection, colour, weave, construction and dimension	According to col 2 of Table 1	Non-conforming rolls/pieces not to exceed the corresponding number given in col 3 of Table 1
b) *Other Requirements*		
Mass, breaking strength, residual size content, electrical conductivity and amount of finish	At least 2 specimens from each roll/piece selected according to col 4 of Table 1 subject to a minimum of 5 specimens	All the test specimens satisfy the relevant requirements

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
1963 : 1981	Methods for determination of threads per unit length in woven fabrics (*second revision*)
3919 : 1966	Methods for sampling cotton fabrics for determination of physical characteristics
4420 : 1967	Methods for determination of conductivity of aqueous and organic extracts of textile materials
4905 : 1968	Methods for random sampling
5463 : 1969	Methods for sampling of cotton fabrics for chemical characteristics
6359 : 1971	Method for conditioning of textiles

IS No.	*Title*	*IS No.*	*Title*
7702 : 1975	Methods of determination of thickness of woven and knitted fabrics	13128 (Part 1) : 1991	Textiles — Fabric, woven glass fibre, for electrical insulation and plastic laminate — Specification: Part 1 Loomstate fabric
11916 : 1986	Continuous filament textile glass yarn for aerospace purposes	SP 45 : 1988	Handbook on glossary of textile terms

ANNEX B

(*Clauses* 5.1.1, 5.1.2, 6.1.2, 6.1.3, 6.1.3.1 *and* 6.1.3.2)

METHODS OF TEST

B-1 DETERMINATION OF RESIDUAL SIZE CONTENT/AMOUNT OF FINISH

B-1.1 Introduction

After a preliminary determination of moisture content, the desized glass fabric is heated so as to ignite any residual size/amount of finish. Since the experimental results depend on differential weighing and as the change in weight is very small, special care is necessary, particularly to prevent access of moisture to the specimen before each weighing.

B-1.2 Procedure

B-1.2.1 From a rectangular specimen of the desized fabric of mass approximately 4 g, fray out five threads from each side so as to leave a fringe. Roll the prepared specimen loosely and tie with a thread of glass yarn taken from the specimen.

B-1.2.2 Weigh the prepared specimen accurately in a weighing bottle of previously determined mass and heat in the drying oven for 30 min at 105 ± 2°C. Cool it in the desiccator and reweigh (M_1).

B-1.2.3 Place the dried specimen in a previously dried and weighed nickel-silver boat and transfer to a combustion apparatus having the essential features shown in Fig. 1 and heat at a temperature of 625 ± 25°C for at least 10 min.

B-1.2.4 After heating, a current of air dried by passage over calcium chloride and then over phosphorus pentoxide shall be drawn through the tube containing the nickel-silver boat and specimen while heating for a further 5 min.

B-1.2.5 Quickly transfer the nickel-silver boat containing the specimen to the drying oven which already holds the previously weighed weighing bottle. After the nickel-silver boat has cooled down, transfer this, together with its contents to the weighing bottle prior to removing from the drying oven.

B-1.2.6 Cool to room temperature in the desiccator and reweigh (M_2).

B-1.2.7 Calculate the percentage of residual size content (R)/amount of finish (F) as given below:

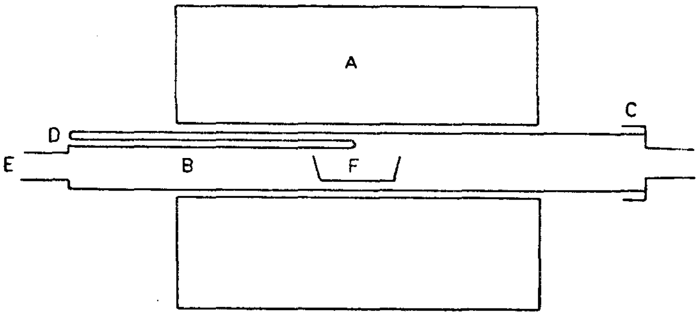
$$R/F = \frac{M_1 - M_2}{M_1} \times 100$$

B-1.3 Any other suitable method may be used provided if it can be shown to give the same results.

B-2 BREAKING STRENGTH

B-2.1 Preparation of Test Specimen and Conditioning

B-2.1.1 Cut six specimens each measuring not less than 65 mm in width and 200 ± 50 mm in



A — Electrically heated furnace
B — Combustion tube
C — Air outler cap (removable)
D — Thermocouple tube
E — Air inlet
F — Nickel-silver boat

FIG. 1 COMBUSTION APPARATUS

length from the test sample in the direction of warp and weft in such a way that no two test specimens cut in the same direction shall contain the same longitudinal threads. Prepare the test specimens either as in **B-2.1.2** or **B-2.1.3**. However, in case of dispute, the method given in **B-2.1.2** shall be used.

B-2.1.2 Lay the specimen on stiff paper and impregnate each end of the specimen with a suitable cement and attached to the paper by the cement, leaving an untreated length of not less than 75 mm in the middle of each specimen. After the cement has dried, remove lengthways threads equally from each side of each specimen by careful cutting and fraying, until the width of each specimen is reduced to 50 mm in the untreated portion. When the specimen has been fixed in the jaws of the testing machine (*see* **B-2.2**) cut the paper across the middle.

NOTE — Samples of suitable cement are:

a) Adhesives based on natural rubber or polychloroprene,

b) A solution of polybutylmethacrylate in xylene, and

c) A solution of polymethylmethacrylate moulding powder in diethyl ketone or butanone.

B-2.1.3 Fray each specimen by removing length ways threads equally from each side of each specimen until the width of the specimen is reduced to 50 mm leaving the cross threads undisturbed. Lay the specimen on flat surface with each end laid between two sheets of polyvinyl butyral so as to leave a 75 mm length uncovered at the middle of each specimen. Cover the sheets of polyvinyl butyral with a medium mass paper and apply an electric iron to soften the polyvinyl butyral and cause it to penetrate and adhere to the test specimen.

B-2.1.4 Condition the specimen (as prepared in **B-2.1.2** or **B-2.1.3**) prior to testing in standard atmosphere of 65±2 percent RH and 27±2°C (*see* IS 6359 : 1971) for at least 6 hours and test them in the standard atmosphere.

NOTE — It is recognized that within temperature range of 22 to 29°C and RH 48 to 67 percent, the difference in the results of testing shall not be significant.

B-2.2 Procedure

Fix the specimen in the jaws of the tensile testing machine so that the unsupported length between the jaws is 75 mm. Open the jaws of the testing machine until wider than the test specimen and with edge parallel to each other and at right angles to the direction of pull. Pack the jaws with suitable material such as chamois leather to assist in gripping the specimen without causing damage. Apply the load to the specimen at a substantially constant rate of traverse of 300±15 mm/min. Repeat the test with the remaining test specimens. Calculate the average breaking strength of six specimens in each direction, that is warp and weft, as average breaking strength in N per cm width.

B-3 QUALITATIVE ANALYSIS OF SILANE FINISHES ON GLASS FABRICS

B-3.1 Principle

A 5 s immersion of a silane treated glass sample in a dye produces a characteristic colour change.

B-3.2 Chemicals Required

Two dyes are required — quinaldine red 0·05 percent in methanol and methyl red 0·1 percent in methanol.

B-3.3 Procedure

B-3.3.1 Prepare samples by cutting glass cloth into one inch squares. If strands are used instead of cloth, they should be cut to lengths of 50 to 100 mm. Dip the sample in the dye solution for exactly 5 s. Timing is very critical, as 2 s in excess yields very different results. Immediately after the removal, rinse the sample under a stream of distilled water for 1 or 2 min. Compare immediately with fresh standard samples prepared by the same procedure (as treated samples change colour as they dry, comparison shall be made immediately).

B-3.4 Analysis of Results

B-3.4.1 *Characteristic Colour Changes in Silane in Dyes*

Silane Type	*Quinaldine Red*	*Methyl Red*
Blank	Colourless to pale pink	Pale yellow
Aminopropyltriethoxy silane	No pick up	Yellow
Methacryloxypropyltrimethoxy silane	Pink	Orange to red orange
Glycidoxypropyltrimethoxy silane	Pink	Yellow

B-4 QUANTITATIVE ANALYSIS OF AMINO SILANE CONTENT ON FINISHED GLASS FABRICS

B-4.1 Principle

The amino-silane content of woven glass fabrics can be obtained by determining the nitrogen content of the fabric.

B-4.2 Procedure

B-4.2.1 Ignite a nickel crucible of 17 ml capacity and a test tube of 75 ml capacity and dimensions 25 × 200 mm (containing a asbestos cushion) at 1 000°C for 5 min. Cool both in a desiccator. Weigh out accurately a 1 to 2 g representative sample (M_1) of finished glass cloth or inorganic filler into the crucible. Cover the sample with about 3 g of KOH pellets. Transfer the crucible to the test tube of 75 ml capacity and place the stopper containing the Kjeldahl connecting bulb and nitrogen inlet tube. Mount the assembly on a ring stand with the bottom two-thirds of the test tube dipped into a cold pot furnace. Connect the pot furnace to a variable transformer. Connect the exit end of the Kjeldahl bulb to a glass delivery tube with a piece of Tygon tubing. The tubing should be at least 60 cm long; this should prevent the boric acid solution from being sucked back into the Kjeldahl bulb. Dip the delivery tube into a 250 ml Erlenmeyer flask. Add 50 ml of the boric acid solution and 3 drops of the methyl red indicator to the flask (the solution should be faintly pink). Connect the inlet tube to a nitrogen cylinder and adjust the flow of nitrogen so that above one bubble per second comes through the delivery tube in the boric acid solution. Shield the upper part of the tube from the radiated heat with an asbestos collar which fits on top of the pot furnace. Direct a jet of compressed air on the rubber stopper to keep it from becoming too hot. Switch on the transformer and increase the voltage over a period of 20 min (slowly at first) until the temperature of the pot furnace is around 500°C. Temperature should not exceed 600°C, as some carryover of potassium may occur. The KOH will be reacting vigorously with the sample. After 30 min the boric acid solution shall be yellow. Titrate the ammonium borate in the Erlenmeyer flask to a faint pink with 0·01 N HCl, keeping the system connected all the while. Continue the heating — purging, distilling operation for another 5 min. If the reaction is complete the solution will remain pink; if it is not complete, more ammonia (NH_3) will distill over and the solution will turn yellow again. In any case, an additional 20 min should complete the operation. Disconnect the tubing from the Kjeldahl flask and wash the inside of the tubing with distilled water. Add these washings to the borate solution: if the solution turns yellow titrate to a faint pink with 0·01N HCl. Note the volume (ml) of ACl used (Y_1). Weigh an untreated sample M_2. Run a blank on this untreated substance. Note the volume (ml) of HCl used (Y_2). Subtract the nitrogen found in the blank from the nitrogen found in the sample to obtain the nitrogen in the amino-silane on the substrate. The nitrogen in amino-silane is then converted to percent amino-silane on substrate.

B-4.3 Calculations

a) $$\%\,N \text{ in sample} = \frac{(\text{ml of HCl} \times \text{N of HCl for sample})\ 100 \times 0{\cdot}014}{\text{Mass of sample in g}} = A$$

b) $$\%\,N \text{ in blank} = \frac{(\text{ml of HCl} \times \text{N of HCl for blank})\ 100 \times 0{\cdot}014}{\text{Mass of treat blat sample in g}} = B$$

c) % N due to amino-silane on substrate $= A - B = C$

d) % amino-silane on substrate $= C \times \dfrac{221}{14}$

B-5 QUANTITATIVE ANALYSIS OF CHROME CONTENT OF FINISHED GLASS FABRICS

B-5.1 The chrome content is determined using an electrophotometer.

B-5.2 Sodium Hydroxide Solution (100 g/l)

Weigh out 100 g of sodium hydroxide (NaOH, pure chemical), dissolve in distilled water and dilute to one litre.

B-5.2.1 *Potassium Dichromate, Standard Solution*

Place sufficient potassium dichromate ($K_2Cr_2O_7$) in a weighing bottle. Heat the weighing bottle (lid off) for 1 hour at 100°C. Replace the cover on the weighing bottle and allow to cool in a desiccator for 30 min. Weigh accurately 0·848 4 g into a 50 ml breaker and dissolve in distilled water. Transfer quantitatively to a 1 000 ml aliquot into another 1 000 ml volumetric flask, dilute to the mark and mix well. This solution will contain 0·000 03 g chromium/ml. Use this final solution for calibration.

B-5.2.2 *Calibration*

By burette, add 5 ml of standard $K_2Cr_2O_7$ solution in 100 ml volumetric flask. Then add 2 ml of NaOH solution; dilute to mark with distilled water and mix well. Rinse a 25 ml photometer cell with some of this solution and then fill the cell. Measure the colour against distilled water in the photometer using a filter. For detailed instruction on measurement of colour, (*see* **B-5.3**). The reading for this solution is equivalent to 0·01 percent chromium on a 1·5 g sample. For the next point, and 10 ml of standard $K_2Cr_2O_7$ solution (by burette) to a 100 ml volumetric flask. Add 2 ml of NaOH solution, dilute to the mark with distilled water and mix well. Measure the colour of this solution as before. The reading for this solution is equivalent to 0·02 percent chromium. Continue preparation of solutions as above in accordance with the following chart:

Chromium percent	0·01	0·02	0·03	0·04	0·05	0·06
Standard solution, ml	5	12	15	20	25	30

Plot photometer reading against chrome percent on graph paper.

B-5.3 Procedure

Weigh exactly 1·5 g of glass fabric sample, cut into small pieces and place in a 400 ml beaker. Add 25 ml of NaOH solution. 35 ml of distilled water and 1·0 g of sodium peroxide. Cover beaker with a watch glass and boil vigorously for 8 min or until frothing ceases. If necessary, add distilled water from a wash bottle to keep the solution from boiling dry, taking care not to lose any solution. Cool the mixture to room temperature. Pour solution into a 100 ml volumetric flask. Wash sample with distilled water into flask and continue to wash until the solution in the volumetric flask is brought to the mark. Stopper the flask, mix well, and filter. Discard the first 15 ml of filtrate. Rinse a 25 ml cell with some of the filtrate and then fill the cell. Place the cell in the front position, of the adapter on the platform. Always fill the cells to within 1 cm of the top before placing them in the adoptor. Place a cell containing distilled water in the rear position. Place filter in position. Set galvanometer needle to coincide with the index line. Next, set the intensity control and pull the platform back until the catch is in firm contact with the front stop. Close the compartment door. Adjust the dial control so that a reading of zero is obtained on the scale. Depress the lamp button and adjust the initial null knob to bring the galvanometer needle back to the index line. Since the lamp requires a few seconds to reach maximum intensity, the initial null knob must be adjusted, holding down the lamp button until there is no tendency for the galvanometer needle to drift away from the index line. Without releasing the lamp button, push the platform knob, moving the platform to the back of the compartment until it is in firm contact with the rear stop. Still holding the lamp button down, bring the galvanometer needle back to the index line by turning the dial control and observe photometer reading.

B-5.4 Calculations

Refer to graph for chromium percent. When the chrome content of the sample is anticipated to be in the range of 0·060 to 0·120 percent, weigh exactly a 0·75 g sample, proceed as earlier and calculate chromium percent as follows:

Chromium percent = Chromium percent from graph × 2.

B-6 QUANTITATIVE ANALYSIS OF SILANE (INCLUDING AMINO) CONTENT ON FINISHED GLASS FABRICS

B-6.1 Principle

A reliable quantitative estimation of the silane content on treated glass fabrics can be obtained by determining the carbon content of the treated fabric. In the gravimetric method, a sample of fabric is weighed to the nearest mg (M_1) the carbon is converted to carbon dioxide by ignition and the carbon dioxide absorbed from the gas stream is weighed to the nearest mg (M_2). In the conductometric method, the amount of carbon dioxide absorbed is measured by difference in solution conductivity.

B-6.2 Calculation of Silane Percent

The carbon dioxide content obtained by either of the above methods is converted back to carbon by the formula:

$$\text{Carbon percent} = \frac{M_2 \times 0{\cdot}272\,9 \times 100}{M_1}$$

Conversion of carbon percent to silane percent is done by the product of the result with an appropriate factor. Since silanes lose part of their weight during application to glass fabric, conversion can be made either to the silane prior to application of the actual weight of silane on the fabric.

Two factors are used to convert carbon percent to silane percent. Factor 1 converts carbon percent to silane percent prior to application. Factor II is used where actual weight of silane on fabric is desired. Both factors for various silanes are given below:

Silane Type	*Factor I*	*Factor II*
Aminopropyltriethoxy silane	3·67	2·53
Methacryloxypropyltri-methoxy silane	2·95	2·13
Glycidoxypropyltri-methoxy silane	3·28	2·32

ANNEX C

(*Foreword* and *Clauses* 5.1, 5.1.2, 6.1, 6.1.2 *and* 9.1)

SOME CONSTRUCTIONAL PARTICULARS OF WOVEN GLASS FIBRE FABRICS GREIGE (GREY)

Variety No.	(Style No.)	Yarn Designation (Numbering) (SI Units)	Weave	Threads/dm		Mass g/m²	Thickness mm	Breaking Strength N per cm Width	
				Ends	Picks			Warpway	Weftway
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	(NA)	EC 5 5·5 1*0	Plain	236	138	21·0	0·028	50	30
2	(1070)	EC 5 11 1*0 (Wp) EC 5 5·5 1*0 (Wt)	Plain	236	138	34·5	0·042	100	30
3	(NA)	EC 5 11 1*0 (Wp) EC 5 5·5 1*0 (Wt)	Plain	216	212	36·5	0·042	90	45
4	(0107)	EC 5 5·5 1*2 (Wp) EC 5 5·5 1*0 (Wt)	Plain	236	138	34·5	0·042	100	30
5	(0108)	EC 5 5·5 1*2	Plain	236	185	47·5	0·051	100	80
6	(1080)	EC 5 11 1*0	Plain	236	185	47·5	0·057	100	80
7	(2112)	EC 7 22 1*0	Plain	160	150	70·0	0·090	140	130
8	(0112)	EC 5 11 1*2	Plain	157	154	70·5	0·081	135	130
9	(0113)	EC 5 11 1*2 (Wp) EC 5 5·5 1*2 (Wt)	Plain	236	252	82·0	0·080	200	110
10	(0010)	EC 9 33 1*0	Plain	126	110	80·0	0·102	165	145
11	(1125)	EC 5 11 1*2 (Wp) EC 9 33 1*0 (Wt)	Plain	157	154	88·0	0·090	135	205
12	(0117)	EC 5 11 1*2	Plain	212	154	83·0	0·090	180	130
13	(2125)	EC 7 22 1*0 (Wp) EC 9 33 1*0 (Wt)	Plain	157	154	88·0	0·100	140	205
14	(1674)	EC 9 33 1*0	Plain	157	126	96·0	0·100	205	165
15	(0116)	EC 5 11 1*2	Plain	236	228	105·0	0·102	200	195
16	(1165)	EC 5 11 1*2 (Wp) EC 9 33 1*0 (Wt)	Plain	236	205	123·0	0·120	200	270
17	(1632)	EC 9 33 1*0 (Wp) EC 9 66 1*0 (Wt)	Plain	126	126	128·5	0·120	165	300
18	(0125)	EC 5 11 2*2	Plain	142	134	125·0	0·127	245	230
19	(0118)	EC 5 11 1*2	4-shaft satin (crow-foot)	354	236	133·5	0·130	305	200
20	(7628)	EC 9 66 1*0	Plain	176	128	206·5	0·175	425	310
21	(0127)	EC 5 11 3*2	Plain	165	126	198·0	0·191	425	325
22	(0141)	EC 7 23 2*3	Plain	126	84	285·5	0·280	665	445
23	(0142)	EC 7 22 2*5	Plain	110	64	394·0	0·381	270	565

(Wp = Warp, Wt = Weft, 1N = 0·102 kgf, N.A. = Not available)

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